

The Classroom Screen

National Film Board of Canada
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Special Issue

September 1968

Government
Publications

CAI
FB
-C 47

for high school Physics and Mathematics

graphs

A new set of overhead projectuals
from the National Film Board of Canada

Produced at the National Film Board of Canada by former physics teachers Maurice Bulbulian and Jean-Marc Garand, this new guide-to-graphs set consists of 20 overhead projectuals with close to 80 illustrative diagrams, printed in four colors on 8" x 10" sheets of clear acetate, for projection on the classroom screen.

Because *Graphs* projectuals are printed on clear acetate, the teacher can make his own additions or adaptations when and where he chooses as the lesson goes on. An accompanying document is attached to each projectual so that step-by-step suggestions are

always in front of the teacher, ready to be incorporated as the lesson proceeds. This document also provides supplementary information as well as complementary exercises. An additional use-as-you-like projectual is included in the set so that the teacher or students can try designing a graph projectual.

The result of two years of research, consultation, testing and design, this complete screen presentation shows clearly how to make graphs, how to analyze them, and how to utilize them effectively in science, mathematics and other subjects.

A Student's Aid to Comprehension

When the student studies a phenomenon, he gathers his data from an experiment. Graphs help him establish relationships, so that he can see how each of the components influences the others. That is why graphs are so essential to the study of physics and mathematics.

The NFB's *Graphs* set provides the science student with the basic methods of graph-making and graph analysis by which he can deduce the connections between a phenomenon, its mathematical expression and its representation as a graph. It is a sure way of comprehending what is happening "beyond the physical appearance". The interpretation of graphs effectively relieves the student of the traditional need to memorize mathematical formulae.

A Teacher's Aid to Instruction

NFB *Graphs* projectuals allow the teacher to develop graph interpretation, a skill vital to any science course. In *Graphs* projectuals the reference phenomenon studied is the trajectory of a rocket — a simple phenomenon but one that lends itself to much useful exploration. Here the basic data of time/displacement and time/velocity are clearly introduced. Then the student moves to deduction of new physical concepts such as acceleration, average velocity, instantaneous velocity, etc. Finally, from the graphs method he achieves an understanding of the elementary concepts of analytical geometry and calculus (slope — increment — derivation — integration).

graphs area under a straight line

H

object
To introduce the calculation of area under a curve.
To show that the area under a curve helps to interpret a phenomenon.
To introduce the operational definition of position by relating it to the area under the velocity vs. time curve.

suggested use

h 1: calculation of the area

Calculate with the students the area under the curve between time 0 and 1 sec.
Ask the students to calculate the area between 0 and 2 sec., and between 0 and 3 sec.

h 2 and h 3: check of the preceding exercise

Emphasize the units of velocity and time and reduce these units.

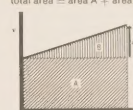
h 4

Relate area and position for the moving rocket

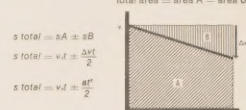
suggested exercise

The following is an interesting exercise by which you can lead the students to an understanding of the equation expressing the displacement in the case of a motion with initial velocity. Give two data charts which will enable the students to draw both graphs shown below. Have them calculate the displacement by the area method. You will notice that in each case, area A represents the displacement without taking the acceleration into account and that area B represents the displacement gained or lost due to the acceleration.

positive acceleration
total area = area A + area B



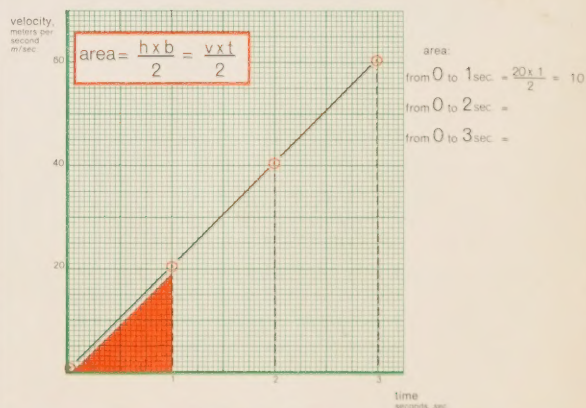
negative acceleration
total area = area A - area B



This relation is usually presented in the following manner: $s = vt \pm \frac{at^2}{2}$
The sign + or - is determined by the acceleration vector (+ a or - a).

graphs area under a straight line

H.1



One of the projectuals for the *Graphs* series. The first picture shows the accompanying text and the sequence of four that follows represent the successive overlays of the projectual. These are on transparent acetate so that as each overlay is added the information develops accordingly on the screen.

Three Basic Concerns

Throughout this set of projectuals, the emphasis is on three primary concerns: *analysis* of physical phenomena, *demonstration* of each new aspect in graph form, *integration* of corresponding mathematical implications. The projectuals permit the teacher to emphasize any one of these at any time, and just as quickly to combine them, simply and clearly.

Applications

Here are some courses where *Graphs* projectuals will assist directly:

Introductory Science

Grades 9 or 10

(General introduction and demonstration of graph-making and analysis)

Physics

Grades 10 and 11

(Supporting material for study of motion)

Mathematics

Grades 10 and 11

(A general and constant reference resource)

Biology, Chemistry, Algebra

(General reference materials)

Technical Schools, Lab Technology,

College I Science and other applications in other courses where teachers see useful applications.

Production and Direction:

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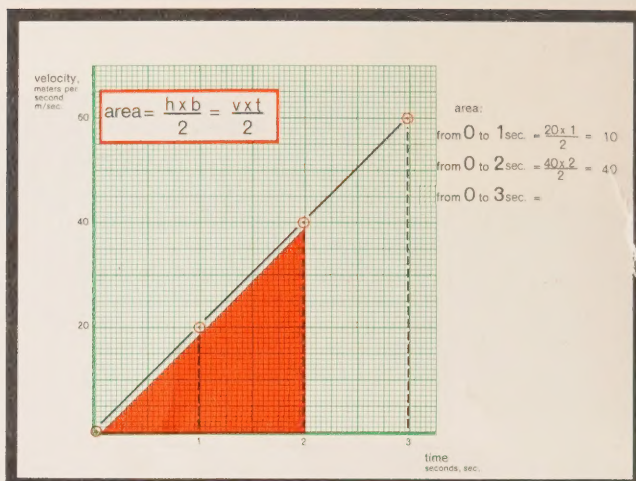
Montreal

Supervising Producer: Hans Möller

graphs

area under a straight line

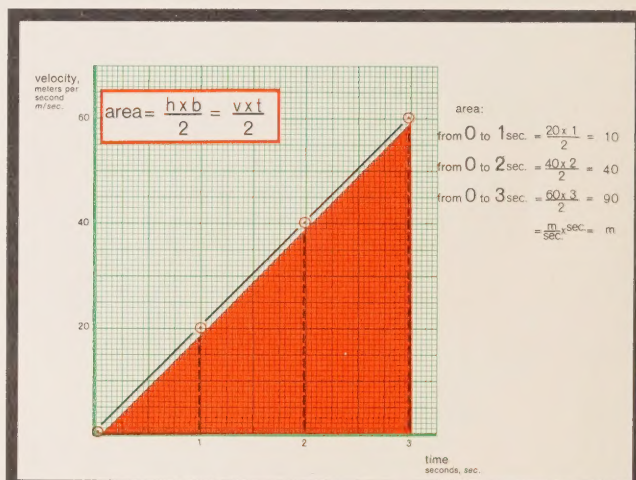
H-2



graphs

area under a straight line

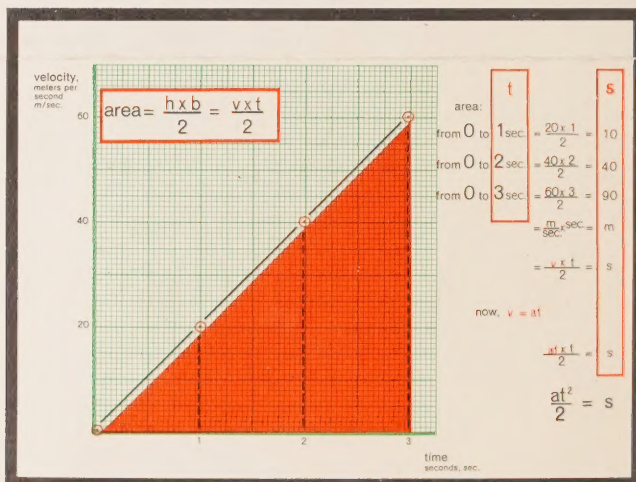
H-3



graphs

area under a straight line

H-4



The *Graphs* set of 20 overhead projectuals plus the exercise projectual is available for purchase at a cost of \$71.00 per set.

Purchase orders should be addressed to:

Canadian Division
National Film Board of Canada
P.O. Box 6100
Montreal 3, Quebec

A postage-paid reply order card is enclosed for your convenience.